



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

L.R.

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
-----------------	-------------	----------------------	---------------------

09/428,052 10/27/99 IRIND K 970901A

MMC2/0928

ARMSTRONG WESTERMAN HATTORI
MCLELAND & NAUGHTON
SUITE 1000
1725 K STREET NW
WASHINGTON DC 20006

EXAMINER

DIAZ, J

ART UNIT

PAPER NUMBER

2815

DATE MAILED:

09/28/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trad marks

Office Action Summary

Application No.

09/428,052

Applicant(s)

IRINO, KIYOSHI

Examiner

José R. Díaz

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

- 1) ☒ Responsive to communication(s) filed on 09 March 2000.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 6-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 6-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some * c) ☐ None of the CERTIFIED copies of the priority documents have been:
1. ☐ received.
2. ☐ received in Application No. (Series Code / Serial Number) _____.
3. ☐ received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 18) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

➤ The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

➤ Claims 6 and 13 rejected under 35 U.S.C. 102(e) as being anticipated by Ito et al. (US Patent No. 5,808,348).

Regarding claim 6, Ito et al. teach a method of fabricating a semiconductor device comprising the steps of: forming a gate oxide film (12) on a substrate (10); forming a gate electrode pattern (20) on said gate oxide film (12); and introducing N atoms into said gate oxide film (12) while using said gate electrode pattern (20) as a mask (column 3, lines 25-27, 30-35, 40-43).

Regarding claim 13, Ito et al. teach forming diffusion regions (28, 30) at both lateral sides of said gate electrode pattern (20) by introducing impurity elements into said substrate (10) through said gate oxide film (12) while using said gate electrode pattern (20) as a mask, and wherein said step of introducing impurity elements is conducted prior to said step of introducing N atoms into said gate oxide film (12) (column 4, lines 34-39).

Claim Rejections - 35 USC § 103

➤ The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

➤ This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

➤ Claims 7-10 rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. (US Patent No. 5,808,348) in view of Hause et al. (US Patent No. 5,861,335).

Ito et al., as stated supra, essentially discloses the claimed invention but fails to show the steps of annealing said gate oxide film in an atmosphere containing N atoms and implanting N ions into said gate oxide film. Regarding claims 7-9, Hause et al. teach introducing N atoms by thermal annealing process in a nitrogen or nitrogen and oxide atmosphere at 800 °C and 900 °C (column 6, lines 28-30 and column 7, lines 33-38). Regarding claim 10, Hause et al. teach introducing N atoms by ion implantation (column 6, lines 42-43)

Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to have modified Ito et al. to include annealing said gate oxide film in an atmosphere containing N atoms and implanting N ions into said gate oxide film as taught by Hause et al. since such modification would result in a process wherein nitrogen atoms are introduced in critical areas of a transistor to prevent charged, hot carriers from being injected from the drain-side of LDD area into trap sites within gate dielectric, as described in column 7, lines 38-42 of Hause et al.

➤ Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. (US Patent No. 5,808,348) in view of Hause et al. (US Patent No. 5,861,335) as applied to claim 10 above, and further in view of Soleimani et al. (US Patent No. 5,596, 218).

Ito et al. in view of Hause et al., as stated supra, essentially discloses the claimed invention but fails to show an acceleration voltage of about 10 keV and a dose of about $1-3 \times 10^{14} \text{ cm}^{-2}$. Regarding claims 11-12, Soleimani et al. teach that the typical implantation parameters include an N_2 concentration of $8 \times 10^{14} \text{ cm}^{-2}$ implanted using an energy of 80 keV (column 3, lines 42-43).

Regarding the difference between the parameters disclosed in the references and in the claimed invention, it would have been obvious to one of ordinary skill in the art, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to have modified Ito et al. in view of Hause et al. to include an N₂ concentration of $8 \times 10^{14} \text{ cm}^{-2}$ implanted using an energy of 80 keV as taught by Soleimani et al. since such modification would result in a high concentration of nitrogen atoms in the gate oxide which reduces the hot-carrier effect, as described in column 4, lines 52-54 of Soleimani et al.

Response to Arguments

➤ Applicant's arguments with respect to claims 6-13 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

➤ The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Japanese Patent JP-07030113 discloses a gate oxide film having an improved withstand voltage and hot carrier resistivity. Ngaoaram (US Patent No. 5,605,848) discloses a dual ion implantation process for gate oxide improvement. Tseng et al. (US Patent No. 5,726,087) disclose a method of formation of semiconductor gate dielectric. Yamazaki (US Patent No. 5,955,745) discloses a semiconductor device having sige spacer under an active layer. Hao et al. (US Patent No. 5,786,254) disclose hot-carrier reliability in submicron MOS devices by oxynitridation. Wang et al. (US Patent No. 6,020,231) disclose a method for forming LDD CMOS.

➤ Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R. Díaz whose telephone number is (703) 308-6078. The examiner can normally be reached on 8:00 - 5:00 Monday through Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mahshid Saadat can be reached on (703) 308-4915. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Art Unit: 2815

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JRD

September 25, 2000



Mahshid Saadat
Supervisory Patent Examiner
Technology Center 2800